

Guide Specifications

InRow RC[®] Chilled Water Cooling Units

100-240V/1ph/50/60Hz (ACRC301S)

208-230V/1ph/50/60Hz (ACRC301H)

200-240V/3ph/50/60Hz (ACRC600 / ACRC600P)

460-480V/3ph/60Hz (ACRC601 / ACRC601P)

380-415V/3ph/50/60Hz (ACRC602 / ACRC602P)

THIS GUIDE SPECIFICATION IS WRITTEN IN ACCORDANCE WITH THE CONSTRUCTION SPECIFICATIONS INSTITUTE (CSI) MASTERFORMAT. THIS SECTION MUST BE CAREFULLY REVIEWED AND EDITED BY THE ARCHITECT OR THE ENGINEER TO MEET THE REQUIREMENTS OF THE PROJECT. COORDINATE THIS SECTION WITH OTHER SPECIFICATION SECTIONS IN THE PROJECT MANUAL AND WITH THE DRAWINGS. WHERE REFERENCE IS MADE THROUGHOUT THIS SECTION TO "PROVIDE", "INSTALL", "SUBMIT", ETC., IT SHALL MEAN THAT THE CONTRACTOR, SUBCONTRACTOR, OR CONTRACTOR OF LOWER TIER SHALL "PROVIDE", "INSTALL", "SUBMIT", ETC., UNLESS OTHERWISE INDICATED. THIS SECTION IS WRITTEN TO INCLUDE THE 2004 MASTERFORMAT AND THE 1995 MASTERFORMAT VERSIONS. WHERE APPLICABLE, THESE ITEMS ARE BRACKETED AND, IN EACH CASE, UNLESS OTHERWISE INDICATED, THE FIRST CHOICE APPLIES TO THE 2004 MASTERFORMAT AND THE SECOND CHOICE APPLIES TO THE 1995 MASTERFORMAT.

PART 1 - GENERAL

1.01 SUMMARY

- A. The InRow product design closely couples the cooling with the IT heat load. This design prevents hot air recirculation while improving cooling predictability and allowing for a pay as you grow environment. Available with and without humidity control, these products are designed to meet the diverse requirements for small to large data centers. Data center operators looking to improve efficiency or deploy high density servers will benefit from the modular design of the InRow Chilled Water products. The intelligent controls of the InRow Chilled Water products actively adjust fan speed and chilled water flow to match the IT heat load to maximize efficiency and address the dynamic demands of today's IT environments.

The InRow Chilled Water Units are available in 300mm and 600mm wide versions. All units automatically monitor and control cooling and filtering functions for the conditioned space. There are two 300mm wide units available: ACRC301S for standard entering water temperatures and ACRC301H for high entering water temperatures. There are two types of 600mm wide units available: ACRC600 series designed for sensible cooling only and ACRC600P series designed specifically for precision temperature and humidity control applications. The ACRC600P series will automatically monitor and control heating, cooling, humidifying, dehumidifying, and filtering functions for the conditioned space.

The systems shall be built to the highest quality engineering and manufacturing standards, and shall be floor mounted and configured for horizontal airflow, with draw-through air pattern, to provide uniform air distribution over the entire face of the coil.

1.02 DESIGN REQUIREMENTS

A. The system is described in the following specification as manufactured by Schneider Electric.

1. Model: _____
2. Total net cooling capacity: _____ kW (MBH)
3. Sensible cooling capacity: _____ kW (MBH)
4. Return air temperature: _____ °C (°F) DB
5. Return air temperature: _____ °C (°F) WB
6. Entering chilled water temperature: _____ °C (°F) WB
7. Humidity: _____ % RH
8. Air quantity: _____ L/s (CFM)
9. External Static Pressure: _____ Pa (in)
10. Reheat capacity: _____ kW (MBH)
11. Humidifier capacity: _____ kg/hr (lb/hr)
12. Electrical supply: _____ V, _____ ph, 50/60 Hz

1.03 SUBMITTALS

A. Submittals are provided with the proposal and shall include: capacity data, electrical data, physical data, electrical connection drawing and piping connection drawing.

1.04 QUALITY ASSURANCE

A. The system shall be completely factory-tested prior to shipment. Testing shall include, but not be limited to, complete pressure and leak testing to ensure system integrity, “Hi-Pot” test, and controls calibration and settings. Each system shall ship with a completed test report to verify completion of factory testing procedure. The system shall be NTRL listed, MCA, and UL Listed to UL 1995 and CSA 22.2 No. 236.

1.05 WARRANTY

A. System parts shall be warranted for a period of 18 months from date of shipment and 12 months from startup. Optional extended warranties are available.

PART 2 - PRODUCTS

2.01 STANDARD COMPONENTS

A. CABINET CONSTRUCTION

1. Exterior panels shall be 18 gauge steel with 3.7lb/ft³ (60kg/m³) density foam insulation. Insulation complies with UL94 HB. Front and rear exterior panels shall be 18 gauge perforated steel with 80% open free area, and equipped with a keyed lock to provide a means of securing access to the internal components of the unit.

2. The frame shall be constructed of 16 gauge formed steel welded for maximum strength. All units shall provide maintenance from the front and rear, allowing units to be placed within a row of racks.
3. All exterior panels and frame shall be powder coated for durability and attractive finish. Exterior frame and panel color shall have color values: L = 13.44, a = 0.43, b = -2.63.
4. Units shall include casters and leveling feet to allow ease of installation in the row and provide a means to level the equipment with adjacent IT racks.

B. VARIABLE SPEED FAN ASSEMBLY

1. ACRC301S/ACRC301H fans: The unit shall be configured for a draw-through air pattern to provide uniform air flow over the entire face of the coil. Each unit shall include eight 200 mm mixed flow direct drive DC axial fans. Each fan assembly should be designed to provide 188.8 l/s (400 CFM) for total unit airflow of 1510.2 l/s (3200 CFM) for ACRC301S. Each fan assembly should be designed to provide 247.8 l/s (525 CFM) for total unit airflow of 1982.1 l/s (4200 CFM) for ACRC301H.
2. ACRC600/ACRC600P series fans: The unit shall be configured for draw-through air pattern to provide uniform air flow over the entire face of the coil. The unit is equipped with variable speed, electrically commutated, 400 mm backward incline fans complete with Inlet Volute. Each fan assembly should be designed to provide 1085.6 l/s (2300 CFM) for total unit airflow of 3256.8 l/s (6900 CFM) without filters. Total CFM with standard filter is 2832 l/s (6000 CFM).
3. Variable Speed Fans: Fans shall be variable speed capable of modulating from 30-100%.
4. Fan Protection: Each fan assembly shall consist of integral fan finger guards.
5. ACRC301S/ACRC301H Operation and Service: The unit should be capable of operation in the event of a fan failure. Fans shall be replaceable while the unit is in operation. The ACRC301H features a handlebar on the front housing for easy grip should a fan need to be replaced.
6. Passive Noise Control (ACRC301H only): Each fan assembly features a housing with a foam lining to provide passive noise control.

A. AUTOMATIC TRANSFER SWITCH

1. The unit shall be equipped with an automatic transfer switch (ATS). The ATS shall automatically switch from a main power supply to a secondary power supply in the event of a power outage or power supply failure, without changing equipment operation. The ATS shall monitor the main power supply so that when the power is restored to the primary source it will automatically switch from the secondary source back to the main power source.

B. MAIN DISCONNECT SWITCH

1. ACRC301S & ACRC301H
 - a. Unit shall be provided with a fuse rated per UL 248-1/UL 248-14/CSA-C22.2 No. 248.1/CSA-C22.2 No. 248.14
 1. ACRC301S: 120-240V 50/60Hz kA 100
 2. ACRC301H: 208-230V 50/60Hz kA 100
 - b. Units shall include a fused live and neutral lines located on the ATS panel in order to individually disconnect primary/secondary power inputs
2. ACRC600/ACRC600P series
 - a. Unit shall be provided with Thermal-Magnetic circuit breakers with interrupt capacity ratings per UL489/CSA C22.2/IEC-947.
 1. Voltage: 200-240V 50/60Hz / kAIC 50

2. Voltage: 380-415V 50/60Hz / kAIC 36
 3. Voltage: 460-480V 50/60Hz / kAIC 22
- b. Units shall include main disconnect switches located on the E-panel in order to individually disconnect primary/secondary power inputs.
- C. DUAL POWER SUPPLIES (ACRC300 series)
1. Power Supplies: The unit shall include two power supplies, each capable of running the unit at 75% capacity in the event of a single power supply failure for ACRC301S and at 75% capacity in the event of a single power supply failure for ACRC301H.
 2. Unit power consumption is not to exceed 1.0 kW during normal operation for ACRC301S, and unit power consumption is not to exceed 1.9 kW during normal operation for ACRC301H. Unit power consumption is not to exceed 3.3 kW during normal operation for ACRC600 series and 15 kW for ACRC600P series.
 3. Operation and Service: Power supply shall be hot swappable.
- D. PRIMARY/SECONDARY POWER INPUT
1. Input Power Feeds: Primary/secondary power inputs should be a locking NEMA or IEC plug (ACRC301S, ACRC600, and ACRC602) or hardwired connection (ACRC301H, ACRC600 series, and ACRC600P series) suitable for the input power selected. Each power input shall be capable of running the unit at 100% capacity in the event of a main power failure.
- E. MICROPROCESSOR CONTROLLER
1. Monitoring and Configuration: The master display shall allow monitoring and configuration of the cooling unit through a touch screen control. Functions include status reporting, set-up, and temperature set points. LEDs report the operational status of the connected air conditioning unit.
 2. Controls: The microprocessor controller shall allow the user to navigate between menus, select items, and input alpha numeric information.
 3. Alarms: The microprocessor controller shall activate a visible and audible alarm in the occurrence of the events listed in the Technical Specifications Manual.
 4. Logging: The microprocessor controller shall log and display all available events. Each alarm log shall contain a time/date stamp. Controller shall display the run time hours for major components.
- F. NETWORK MANAGEMENT CARD
1. The unit shall include a network management card to provide management through a computer network through TCP/IP. Management through the network should include the ability to change set points as well as view and clear alarms.
 2. Modbus TCP/IP and RTU: Units shall support Modbus TCP/IP and RTU.
- G. COOLING COIL
1. The ACRC301S cooling coil shall use a raised lance type aluminum fin and 9.5-mm (3/8-in OD) copper tube coils. Coil end supports shall be a minimum 18 gauge galvanized steel. Coil shall be rated for a maximum pressure of 2070 kPa (300 psig). The coil is configured in a counterflow arrangement to enhance heat transfer efficiency.
 2. ACRC301H Cooling coil shall use a corrugated type horizontal aluminum fin and 9.5-mm (3/8-in OD) vertical copper tube coils. Coil tube sheets shall be a minimum 18 gauge G90 galvanized steel. The coil shall be rated for a maximum pressure of 2070 kPa (300 psig). The coil is configured in a counterflow arrangement to enhance heat transfer efficiency.

3. The ACRC600 & ACRC600P series cooling coil shall use a raised lance type corrugated aluminum fin and 12.7-mm (1/2-in) OD copper tube coils. Fin shall be a minimum of 0.0055 in thick. Tube wall shall be a minimum of 0.016 in thick. Coil tube sheets shall be a minimum 18 gauge G90 galvanized steel. The coil shall be rated for a maximum pressure of 2757.9 kPa (400 psig). Coil headers are equipped with drip plates in the bottom to route the condensate accumulating on the header tubes to the condensation pan. The coil is configured in a counterflow arrangement to optimize heat transfer efficiency.
4. Cooling Fluids
 - a. Chilled Water and solutions of propylene or ethylene glycol up to 50% may be used. Solutions of brine or other aqueous salt are NOT permitted.
5. Freeze Protection
 - a. Per ASHRAE Handbook Fundamentals 2001 21.5, a maximum of 30% ethylene glycol and 35% propylene glycol are needed for freeze protection. Consult the ASHRAE handbook for more details.

H. 2/3-WAY MODULATING VALVE

1. ACRC301S & ACRC301H

- a. A proportional valve shall be microprocessor controlled to automatically direct the proper amount of chilled water in the cooling coil to maintain desired conditions. A shut-off valve located in the bypass line may be manually adjusted for 2-way flow if so desired.
- b. Three way control valve shall be rated for 360 psig with a brass body and nickel/chromium-plated brass ball.
- c. Valve Actuator: Actuator shall be a direct connect rotary proportional actuator with analog signal feedback, and should be capable of being replaced without disconnecting piping from the valve. Ability for manual operation is also provided (ACRC301S only). A spring return mechanism is attached to the actuator for the ACRC301H unit.

2. ACRC600 & ACRC600P series

- a. A floating point valve shall be microprocessor controlled to automatically direct the proper amount of chilled water in the cooling coil to maintain desired conditions. A shut-off valve located in the bypass line may be manually adjusted for 2-way flow if so desired.
- b. Three way control valve shall be rated for 300 WOG with brass body and stainless steel ball.
- c. Valve Actuator: Actuator shall be direct connect rotary floating point style actuator with potentiometer feedback, and should be capable of being replaced without disconnecting piping from the valve. Ability for manual operation is also provided.

I. CONDENSATE PAN (excluding ACRC301H)

1. The unit shall consist of a primary drain pan (ACRC600/P series) and a secondary drain pan (ACRC301S). The secondary drain pan shall be piped to the primary pan for removal of condensate. The primary drain pan shall include a condensate pump and dual floats for control and overflow protection.

J. CONDENSATE PUMP

1. ACRC301S: The factory-installed condensate pump is piped internally to the condensate pan. It is capable of pumping 5 L/h (1.3 GPH) liquid a maximum distance of 15.2 m (50 ft), which may include a maximum lift of 4.9 m (16 ft). Dual floats are included with the unit. One float is used for condensate pump control, the other to generate condensate pan overflow alarms.
2. ACRC600/ACRC600P series: The factory-installed condensate pump is piped internally to the condensate pan. It is capable of pumping 31.8 l/h (8.45 GPH) liquid a maximum distance of 18 m (60 ft), which may include a maximum lift of 3.5 m (11.5 ft). Dual floats are included with the unit. One float is used for condensate pump control, the other to generate condensate pan overflow alarms.

K. DEW POINT CONTROL PUMP (ACRC301H only)

1. The dew point control pump is piped internally to the cooling unit and recirculates water into the coil to elevate the coil temperature above the dew point.
2. The maximum pump pressure is 16 bar (232 psig).
3. Variable Speed pump shall be capable of modulating from 30-100%.
4. Pump kit is optional and installed separately.

L. FILTERS

1. ACRC301S & ACRC301H
 - a. The standard air filter shall be <20% efficient per ASHRAE 52.1, MERV 1 per ASHRAE 52.2, 1/2-in washable mesh filter.
 - b. The optional air filter shall be high capacity 2-in pleated, UL 900 Class 2, Moisture with average atmospheric dust spot efficiency of 30% per AHRAE Standard 52.1, MERV 8 per ASHRAE 52.2.
2. ACRC600/ACRC600P series
 - a. The standard filters shall be 30% efficient per ASHRAE Standard 52.1, UL Class 2 (MERV 8 per ASHRAE 52.2). Filters shall be EN779 G4 efficient. The 96 mm (3.75 in) deep, pleated filters shall be replaceable from the rear of the unit.
 - b. The optional filter shall be 85% efficient per ASHRAE Standard 52.1 (MERV 13 per ASHRAE 52.2, EN779 F7).

M. HUMIDIFIER (ACRC600P series only)

1. Humidifier shall be able to modulate capacity. The humidifier shall be self-contained, steam generating type, factory piped and wired, with disposable cylinder and automatic solid-state control circuit. Humidifier canisters shall be replaceable. The humidifier controller shall communicate directly to the microprocessor controller and provide complete status and control at the operator interface. Humidifier shall control flush cycling and conductivity via automated controls. Humidifier shall be capable of producing up to 6.6 lb (3 kg) of steam per hour.

N. ELECTRIC REHEAT (ACRC600P series only)

1. Reheat elements shall be low watt density, wired for three-phase, loaded equally on all three phases and shall be electrically and thermally protected by both automatic and manual reset cutouts. Reheat capacity shall be 9 kW.
2. Reheat coils shall be stainless steel, fin tubular construction. Heater casing shall be 20 gauge G90 galvanized steel.
3. Heater shall be provided with self-engaging electrical connectors upon installation. Heaters with manually connected conductors are not acceptable.

O. TEMPERATURE AND HUMIDITY SENSORS

1. ACRC301S & ACRC301H

a. Internal Sensors

1. Internal Temperature Sensors: Thermister temperature sensors shall be mounted behind the front and rear doors to provide control inputs based on supply and return air temperature. Sensor accuracy shall be within $\pm 2^{\circ}\text{F}$ accuracy.
2. Internal Humidity Sensors: Humidity sensors shall be mounted behind the rear door (ACRC301H only)

b. Remote Temperature Sensors

1. One remote temperature sensor shall be shipped with the unit for placement in the field to provide control input based on rack inlet temperature.

2. ACRC600 & ACRC600P series:

a. Internal Sensors

1. Internal Temperature Sensors: Thermister temperature sensors shall be mounted behind the front and rear doors to provide control inputs based on supply and return air temperature. Sensor accuracy shall be within ± 1 degree F accuracy.
2. Internal Humidity Sensors: A humidity sensor shall be mounted behind the front door and shall provide control input based on humidity in supply air (ACRC600 series) and another humidity sensor shall be mounted behind the rear door and shall provide humidifier control input based on humidity in return air (ACRC600P series). Humidifier sensor shall be $\pm 3\%$ RH accuracy full scale.

b. Remote Temperature Sensors

1. Three remote rack inlet temperature sensors shall be shipped with the unit for placement in the field to provide control input based on rack inlet temperature.
3. Water Temperature Sensors: Internal supply and return chilled water temperature sensors shall be installed into sealed wells. Wells are filled with thermal conducting heat transfer grease to provide accurate temperature sensors.

P. SELECTABLE TOP OR BOTTOM PIPING

1. ACRC301S & ACRC301H

- a. Bottom piping connections are standard from factory. Unit can be field modified for optional top piping. Unit connections shall be made internal to the unit.

2. ACRC600 & ACRC600P series:

- a. Pipe connections for field connection from either the top or bottom of the unit. Unit connections shall be made internal to the unit.
- b. The unit shall include two pipe adapters that convert a 38.1 mm (1 1/2 in) NPT to a 38.1 mm (1 1/2 in) BSPT (manufactured in accordance with BS21). Pipe adapters shall ship loose with the unit for field installation where applicable.

Q. FLOW METER

1. The flow meter shall be factory piped inside the unit and connected to microprocessor controls to provide water flow rate through the unit. The microprocessor controller shall also use this information to provide total unit capacity out of the unit while in operation.
2. The flow meter shall be a glass filled nylon construction vortex-sensing meter, compatible with glycol/water solutions up to 50% with accuracy of 2.5% FS @ 10–200 LPM (2.6–53 GPM).

R. PIPING

1. The unit shall be piped in accordance with the highest commercial quality procedures. The chilled water piping shall be insulated with closed cell elastomer insulation. All piping connections should be made at the rear of the unit for top or bottom accessibility.

S. CONFIGURATIONS

1. Cool setpoints shall range from 18°C – 35°C.
 - a. Delta-T for ACRC600/P series shall range from 5.6-16.7°C in CACS and HACS modes.
 - b. Delta-T for ACRC301S/H series shall range from 5.6-22.2°C in CACS and HACS modes.
2. Identical cooling units can be grouped up to 12 units total.
3. Four configuration types are available: InRow mode, HACS mode, RACS mode, and CACS mode.

T. CABLE WATER DETECTOR (OPTIONAL)

1. An optional leak detection sensing cable can be shipped loose with the unit. If water or other conductive liquids contact the cable anywhere along its length, the main controller visually and audibly announces the leak.
2. Cable may be cascaded up to 24.4 m (80 ft).

U. BRIDGE POWER CABLE TROUGH

1. An overhead power distribution bridge, that sits between adjacent NetShelter racks and allows for removal of the unit without disrupting the overhead power cabling, is available as an accessory.
2. The cable trough shall be constructed of 16 gauge cold rolled steel with a black powder coat finish.

V. BRIDGE DATA PARTITION

1. An overhead cable distribution bridge that sits between adjacent NetShelter racks and allows for removal of the unit without disrupting overhead cabling, is available as an accessory.
2. The data partition shall be constructed of 16 gauge cold rolled steel with a black powder coat finish.

W. COMPATIBLE PRODUCTS

1. The InRow Chilled Water units shall be compatible with: Hot Aisle Containment, Rack Air Containment, and the Active Flow Controller.
2. The ACRC301S and ACRC301H units shall be compatible with Cold Aisle Containment.

PART 3 - EXECUTION

3.01 GUIDELINES FOR INSTALLATION

A. GENERAL

1. The InRow RC provides reliable, accurate temperature control of computer rooms, laboratories, and other environments that require close tolerance control. The unit incorporates the latest system design innovations to provide you with optimum efficiency, reliability, and accuracy of control.
2. The InRow RC unit will provide years of trouble-free service, when installed and maintained by technically qualified personnel. For more detailed information, see the InRow RC Installation Manual.

B. ROOM PREPARATION

1. During the design of the room, consideration should be given to the following factors:
 - a. Ease of entry for the system, floor-loading factors, and accessibility of piping and wiring.
 - b. The room must be sealed with a vapor barrier to minimize migration of moisture.
 - c. Polyethylene film (plastic sheeting) is a good vapor barrier for ceiling and wall applications.
 - d. Rubber-based or plastic-based paints should be applied to concrete floors and walls.
 - e. The room should be thoroughly insulated to minimize thermal loads and make-up air (if required) should be preconditioned to reduce additional temperature, filtration, and moisture loads.

C. SERVICE ACCESS

1. At least 914.4 mm (36 in) of clear space must be left in front of and behind the unit for routine service. In order to service the unit outside of the row, an area of 1219.2 mm (48 in) of clear space is required in front of and behind the unit while it is in the row.

D. RECEIVING THE UNIT

1. Your InRow RC unit has been completely tested and inspected before shipment. To ensure that you have received the unit in excellent condition, perform a careful inspection of the crating and the unit immediately upon receipt.
2. Verify that all parts ordered were received as specified and that the unit is the correct size and voltage necessary to fulfill your environmental control needs.
3. Report any damage discovered to the freight carrier.
4. If necessary, contact the APC field service department for help in repairing or replacing damaged parts. While APC is not responsible for damage incurred in transit, we want to make sure that you have no undue delays in your system start-up.

E. RIGGING

1. The unit is manufactured with a formed steel frame for maximum strength and unit integrity; however, as with all electrical and mechanical equipment, you must take care with proper rigging of your unit.
2. When using a forklift to move the unit, use the shipping skid to protect the bottom of the unit. When using chains, cables, or rope to lift the unit, use spreader bars to prevent damage to the finished panels. Four threaded M10x16 holes are provided to accommodate lifting eye bolts that can be utilized to lift the unit.
3. Exercise caution when maneuvering and transporting the cooling unit as it can tip easily.

F. CONDENSATE DRAIN ROUTING

1. ACRC301S series: Condensate from the evaporator pan is collected and discharged by the condensate pump to a 5 mm (0.188 in ID) condensate line supplied with the unit. Additional condensate piping is required to route the condensate line to the building.
2. ACRC600 series—Condensate from the evaporator pan is collected and discharged by the condensate pump to a 9.5 mm (0.375 in ID) condensate line supplied with the unit. Additional condensate piping is required to route the condensate line to the building.

3.02 FIELD QUALITY CONTROL

A. APPLICATION OF GUIDE SPECIFICATIONS

1. Because of an ongoing program dedicated to product improvement, specifications are subject to revisions without notice. APC by Schneider Electric assumes no responsibility, and disclaims all liability for damages resulting from use of this information or for any errors or omissions.